Comparison of Estrus Synchronization Protocols and Fixed-Timed Artificial Insemination on Pregnancy Rate of Heifers

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Background

Development of replacement heifers is a critical component for the beef cattle industry. It is critical because replacement heifers are still growing, allocating nutrients to maintain their own body condition, all the while trying to conceive and calve by the time they are 2 years of age. Heifers that conceive early in their first breeding season will calve earlier in the calving season and wean more calves that are heavier during their lifetime (Lesmeister et al., 1973).

Fixed timed artificial insemination (FTAI) can be used to influence heifers to breed earlier in the breeding season, calve earlier in the calving season, and therefore provide additional days to rebreed for a second parity and beyond. Fixed timed AI is designed to control the ovulation timing in heifers and eliminate the need of estrus detection (Hall et al., 2009). Pregnancy rates have been observed in beef heifers that were synchronized with a 7-day CIDR protocol and reported to be 43%-60% (Leitman et al., 2008). Because estrus detection in replacement heifers can be inconsistent and time consuming, the use of FTAI is an enticing option that producers can use to minimize time requirements, maintain reproductive efficiency, and integrate superior genetics.

Objectives

The objective of this study is to investigate the success rate of timed artificial insemination protocols, by comparing the pregnancy status of Angus heifers using a 7-day Co-Sync+CIDR® versus a 14-day CIDR® - PG timed artificial insemination procedures.

Procedures

All animal procedures are approved by the Angelo State University Institutional Animal Care and Use Committee Protocol #14-05. Spring born Angus heifers (n = 22) will be used for this study. All heifers originate from the Angelo State University Angus herd and will be managed at the Management Instruction and Research center (MIR). All heifers will be turned out on native pasture/with protein supplementation from November 2015 to February 2016 and be managed to maintain .23 to .32 kgs per day average daily gain. In February 2016 all heifers will be put in feeding pens with ad libitum access to a diet designed to allow them to gain approximately 1.81 kgs per day average daily gain..

Heifers were stratified by weaning weight and sire into 1 of 2 treatment groups. One treatment arrangement was managed to a 14-day CIDR® - PG (14Day) timed AI protocol group, and the other was a 7-day Co-Sync+CIDR® (7Day) timed AI protocol group. The administration of each protocol was set up so that the timed AI event would occur simultaneously for both treatment arrangements to limit variation of success rate due to differences in weather patterns or ambient temperature changes. A visual representation of the treatment protocols is presented in figure 1. Thirty days after insemination blood was drawn, 5 mL via jugular vein, was collected and the presence of Pregnancy-Specific Protein B (PSPB) was used to determine the pregnancy status of the fixed-time artificial insemination via the bioPRYN ELISA kit. (BioTracking, 2016).

Statistical Analysis

Frequency distribution of pregnancy occurrences were analyzed with the PROC FREQ procedure of SAS (SAS Inst. Inc., Cary, NC) with the chi-squre / fisher's option to determine distributions of PREGNANCY STATUS × SYNCH. PROTOCOL. Additionally, the χ^2 of PREGNANCY STATUS × SIRE GROUP was of secondary interest in this study and all distributions with ($P \leq 0.1$) were considered as being different.

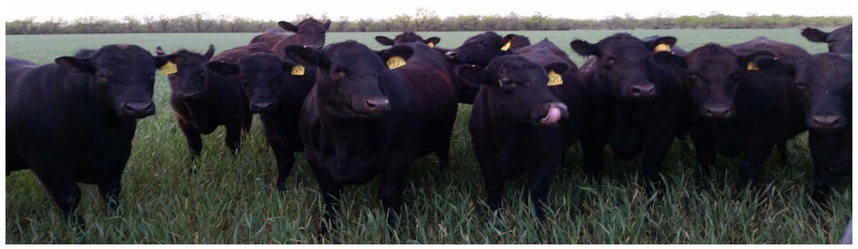
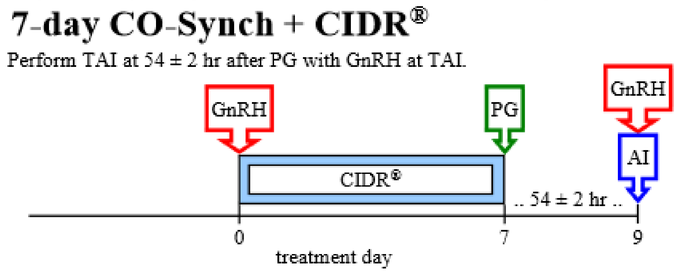
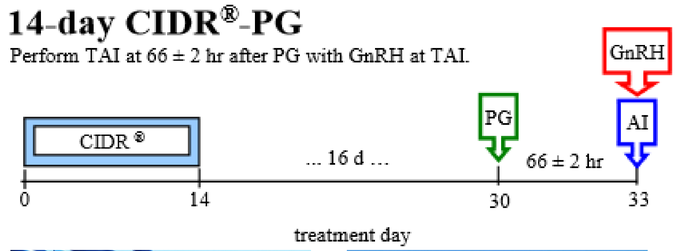


Figure 1. Days and procedures of Timed AI synchronization protocols





Results

Occurrences of pregnancy status was not statistically connected to the synchronization protocol treatments in this data (Table 1.). It was observed however, that both synchronization protocols yielded pregnancy percentages that were near the expected normal levels as described by Leitman et al . (2008).

Table 1. Pregnancy Status × Synchronization Protocol Frequency Table

FTAI Pregnancy Status	14-Day Protocol	7-Day Protocol
Bred	7	4
Open	4	7
% Females pregnant	63.64%	36.63%
(P = 0.39)		

As a secondary objective in this study we were interested in the occurrence of pregnancy in these heifers as it was related to the 3 sire groups that were represented in the 2015 calf crop at the ASU Management Instruction and Research Center (MIR) (Table 2.). These data suggest that response to estrous synchronization (ES) and a fixed timed artificial insemination (FTAI) procedure can be influenced genetically as 85.71% of the daughters sired by Momentum 9274 conceived to the FTAI while only 33.33% of the Insight 8382b and Consensus 2699b daughters conceived to the FTAI respectively.

Table 2. Pregnancy Status × Sire Frequency Table

FTAI Pregnancy Status	Insight 8382b	Consensus 2699b	Momentum 9274
Bred	3	2	6
Open	6	4	1
% Females pregnant	33.33%	33.33%	85.71%
(P = 0.09)			

Upon completion of the project, the cost analysis of the synchronization protocol treatments was calculated and a final ***Cost Per Pregnancy*** value was determined based upon the total cost of the ES and FTAI divided by the number of females that conceived and this data is presented in table 3. Based on these results the 14-day protocol cost 52.8% less per pregnancy than the 7-day synchronization procedure.

Table 3. Cost Per Pregnancy Analysis

	7-Day Sync Protocol	14-Day Sync Protocol
Cystorelin	$3.06	$0.00
CIDR	$11.48	$11.48
Lutalyse	$2.64	$2.64
Cystorelin (At Breeding)	$3.06	$3.06
Bartel Asset 402 Semen	$20.00	$20.00
Cost per Head	**$40.24**	**$37.18**
No. in Group	n = 11	n = 11
Total ES and FTAI cost of group	$442.64	$408.98
No. pregnant heifers in group	n = 4	n = 7
Cost Per Pregnancy	***$110.66***	***$58.43***

Conclusions and Implication

Occurrences of pregnancy was only numerically different between the synchronization protocol treatment groups but the effect of sire was different (P = 0.09). In a retrospective cost analysis, it was observed that the cost per pregnancy of the 14-Day synchronization program was more preferable and would therefore most likely be the favored method of estrous synchronization (ES) because of the higher number of females bred and reduced cost of implementation.

This data suggests that pregnancy occurrence from ES and fixed timed artificial insemination (FTAI) in Angus heifers can be improved by genetic components and using a 14-day CIDR® - PG FTAI protocol.

Literature Cited

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